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On the Orbit of 42 Comæ Berenicis = Σ 1728.
By T. J. J. See, A.M., Ph.D. (Berlin.)

In the course of a general revision of the orbits of double stars I had occasion some three years ago to examine the theory of 42 *Comæ Berenicis*. Professor Burnham generously placed at my disposal a list of measures which was nearly complete, and I have since added to it such as were omitted, and made also new observations during 1895. When scrutinised under the fine definition of the 26-inch Clark refractor of the Leander McCormick Observatory of the University of Virginia, the pair proved to be excessively close, and with a power of 1,300 could only be elongated. As the object has now become single in all existing telescopes, and cannot again be separated until about 1899, I take this opportunity to present to the Society an investigation of the orbit of this peculiarly interesting star. The only previous investigation of the orbit is that made by Otto Struve and Dubiago in 1874 (*Monthly Notices*, 1874-75, p. 367). Struve's elements are as follows :—

Q Q

$P = 25.71$ years.	$\Omega = 11^{\circ}0$
$T = 1869.92$	$i = 90^{\circ}$
$e = 0.480$	$\lambda = 99^{\circ}18$
$a = 0''.657$	

The method followed here is not very different from that employed by Struve, except that the results are based on the measures of all reliable observers and are rendered more complete by observations made since 1874—indeed, up to the occultation of 1896.

It will be seen from an examination of the table at the end of the paper that the motion is to all appearances exactly in the line of vision, and hence, with the exception of the node and inclination, the elements are based wholly on the measures of distance. Struve's elements are fairly good, and it would, therefore, be sufficient to apply differential corrections to his values; but as I had independently adopted a graphical method similar to that employed by him, it seemed of interest to make use of it in deriving approximate values directly from the phenomena.

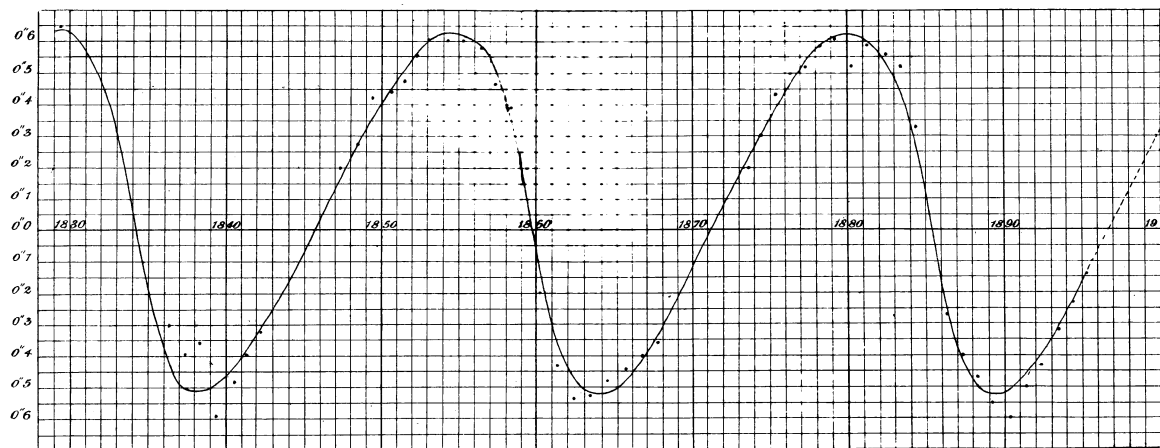
When the elements had been approximately determined the observations furnished 52 equations of condition for determining five unknowns; weights were assigned in proportion to the number of nights, and when the least square solutions had been effected the corrected elements came out as follows :—

$P = 25.556$ years.	$\Omega = 11^{\circ}9$
$T = 1885.69$	$i = 90^{\circ}$
$e = 0.461$	$\lambda = 280^{\circ}5$
$a = 0''.6416$	$n = \pm 14^{\circ}09$

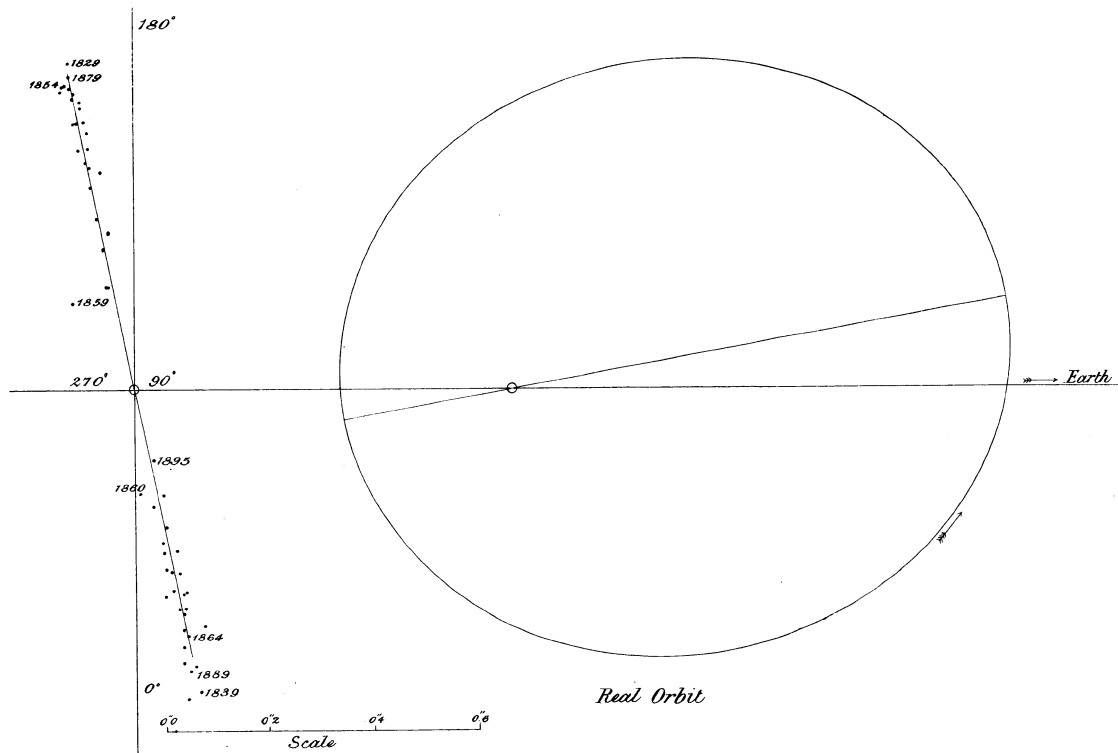
Apparent orbit :

Distance of star from centre	$= 0''.054$
Length of major axis	$= 1''.147$
Length of minor axis	$= 0.00$
Angle of major axis	$= 11^{\circ}9$
Angle of <i>Periastron</i>	$= 11^{\circ}9$

The apparent phenomena are shown in the accompanying diagram, to which is added a figure of the real orbit. A



Graphical Illustration of the Motion of 42 Comae Berenices = Σ 1728.



42 Comae Berenices = Σ 1728.

graphical illustration of the motion, obtained by taking the x axis to represent the time, while the ordinates represent the distances, was employed in finding the approximate values of the elements; the curve here given represents the motion according to the elements as corrected.

This orbit of 42 *Comæ Berenicis* is one of the most exact of double-star orbits, and will finally require but very slight improvement. The period can hardly be in error by more than 0.1 year, while a variation of ± 0.01 in the eccentricity is not to be anticipated.

Comparison of Computed with Observed Places.

	θ_0	ρ_0	$\theta_0 - \theta_c$	$\rho_0 - \rho_c$	n
1827.83	189.5	obl.	- 2.4	+ 0.01	2-1
1829.40	191.6	0.64	- 0.3	...	3
1833.37	70.7?	obl.	- 21.2	...	1
1834.43	228.3	obl.	+ 36.4	...	1
1835.39	11.2	...	- 0.7	...	4
1836.41	10.2	0.30	- 1.7	- 0.12	3
1837.40	11.0	0.39	- 0.9	- 0.11	6
1838.41	11.5	0.36	- 0.4	- 0.15	3
1839.42	12.2	0.59	+ 0.3	+ 0.09	...
1840.60	17.1	0.48	+ 5.2	+ 0.04	6
1841.40	14.6	0.40	+ 2.7	+ 0.02	14-7
1842.43	14.7	0.32	+ 2.8	+ 0.02	7-3
1843.36	single	...	...	...	2
1844.32	189.5	...	- 2.4	...	2
1845.47	single	...	...	...	...
1846.40	66.8?	obl.?	+ 54.9	...	3
1847.42	195.5	0.20	+ 3.6	+ 0.02	1
1848.42	192.7	0.27	+ 0.8	0.00	3
1849.42	188.6	0.42	- 3.3	+ 0.06	3
1850.69	192.3	0.44	+ 0.4	- 0.01	4
1851.55	190.9	0.47	- 1.0	- 0.04	8-6

Q Q 2

	θ_0	ρ_0	$\theta_0 - \theta_c$	$\rho_0 - \rho_c$	n
	$^{\circ}$		$^{\circ}$	"	
1852.42	191.0	0.55	- 0.9	- 0.01	9-8
1853.28	193.0	0.60	+ 1.1	\pm 0.00	21-16
1854.39	193.5	0.60	+ 1.6	- 0.02	14-13
1855.41	193.9	0.59	+ 2.0	- 0.02	4-3
1856.59	192.4	0.57	+ 0.5	0.00	14-13
1857.44	193.0	0.47	+ 1.1	- 0.04	5-3
1858.42	192.4	0.39	+ 0.5	+ 0.04	8
1859.36	215.8	0.2 \pm	+ 23.9	+ 0.06	3
1860.34	3.5?	0.2 \pm	- 8.4	+ 0.08	1
1861.40	13.1	0.43	+ 1.2	+ 0.09	4-2
1862.34	12.4	0.54	+ 0.5	+ 0.08	11-2
1863.35	10.2	0.53	- 1.7	+ 0.01	2
1864.42	12.3	0.48	+ 0.4	- 0.03	6-4
1865.56	12.4	0.44	+ 0.5	- 0.03	13-8
1866.64	8.5	0.40	- 3.4	- 0.01	3
1867.62	13.9	0.36	+ 2.0	+ 0.03	4-2
1868.44	15.8	0.21	+ 3.9	- 0.04	2
1869.37	15.2	0.61?	...	...	5
1870.45	16.0	0.61	...	...	4
1871.41	194.6	0.61	...	...	3-0
1872.47	200.0	0.61	...	...	3
1873.60	194.7	0.20	+ 2.8	- 0.03	5-2
1874.41	189.2	0.30	- 2.7	0.00	2
1875.42	191.3	0.43	- 0.6	+ 0.03	26-25
1876.40	190.4	0.50	- 1.5	+ 0.03	16
1877.43	190.9	0.52	- 1.0	- 0.01	17-13
1878.40	191.4	0.58	- 0.5	0.00	11-8
1879.40	191.9	0.61	0.0	0.00	12
1880.38	193.0	0.52	+ 1.1	- 0.10	8
1881.24	192.3	0.59	- 0.4	- 0.02	26-18
1882.52	190.9	0.56	- 1.0	+ 0.02	12-18

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<i>t</i>	θ_0	ρ_0	$\theta_0 - \theta_c$	$\rho_0 - \rho_c$	<i>n</i>	
	[°]		[°]	"		
1883·46	192·3	0·52	+ 0·4	+ 0·09	19-18	
1884·40	192·7	0·33	+ 0·8	+ 0·07	7	
1886·46	12·9	0·27	+ 1·0	+ 0·02	9	
1887·43	13·3	0·40	+ 1·4	- 0·01	13	
1888·33	11·5	0·47	- 0·4	- 0·02	7-6	
1889·25	11·1	0·55	- 0·8	+ 0·03	7	
1890·38	9·9	0·60	- 2·0	+ 0·09	16	
1891·44	11·0	0·50	- 0·9	+ 0·05	12	
1892·40	11·4	0·43	- 0·5	+ 0·04	16-13	
1893·45	10·2	0·32	- 1·7	+ 0·01	5	
1894·41	9·0	0·23	- 2·9	+ 0·01	8	
1895·29	13·9	0·14	+ 2·0	0·00	3	

The University of Chicago :
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